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(54) **Vending machine.**

(57) Control circuitry for a vending machine allows a number of products to be purchased during a single transaction at a reduced rate as compared with the price of a single product purchased individually. The basic product price and the prices of additional products in any one transaction are preset by means of switches (51, 52, 53) coupled to inputs (I - 1,2,3,4,5) of a microprocessor (MP). Inputs (I - 11,12,13) of the microprocessor are coupled to switches in the coin accepting mechanism (not shown) of the vending machine such that escrow credit towards the purchase of products is stored during any transaction; when a vend is requested, the microprocessor automatically dispenses the number of products appropriate to the escrow credit established in its memory and if necessary activates a change return mechanism in respect of any excess money deposited.
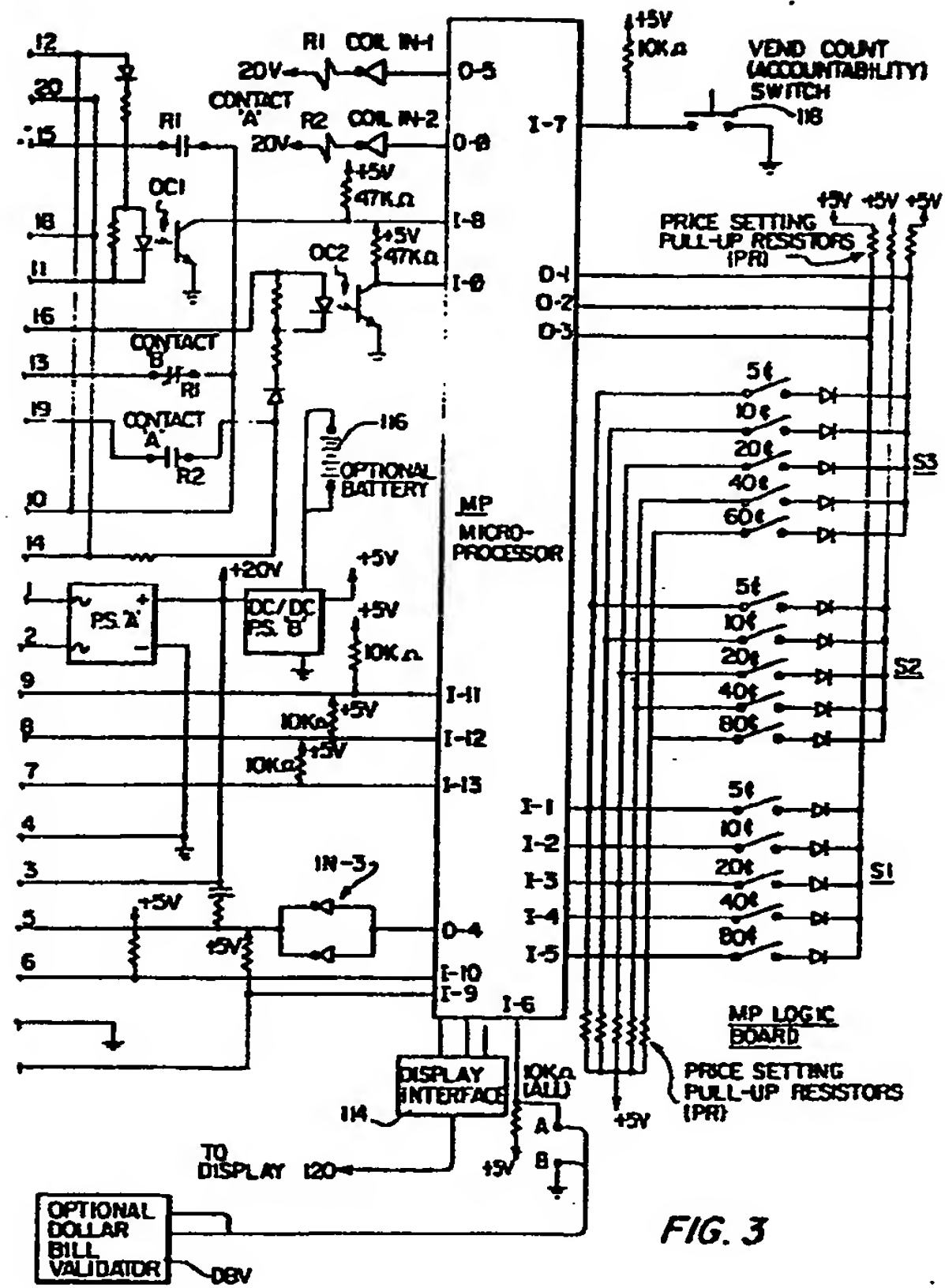
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FIG. 3

Vending Machine

The present invention relates to a single price
electromechanically actuated vending machine
including an electronic multiple purchase module
giving the machine the capability of selling
5 products at a discount if purchased collectively
during a single sales transaction. More specifi-
cally, the discount module of the present invention
enables the vending machine to sell products in one-
for, two-for, or three-for combinations during a
10 single sales transaction or vend cycle.

Heretofore, attempts have been made to offer
discount prices for vended products purchased
in large quantities as an inducement to customers to
purchase more products. Various systems have been
15 designed and implemented for providing vending
machines with this capability, but none of these
systems of the prior art have had the requisite
amount of simplicity and low cost to facilitate
retrofitting into existing state of the art of coin-
20 operated vending machines. One example of a prior
art device of this general type is disclosed in U.S.
Patent 4,008,792 to Levasseur, et al. The Levasseur
Patent describes a vending machine control circuit,
including solid state control circuitry, and it
25 alludes to the desirability of providing discount
prices for products purchased in large quantities. A
general description of the implementation of
discount pricing in the Levasseur system is
described in column 8, lines 3 to 20. However, this
30 description merely addresses the desirability of
providing discount pricing, and does not disclose a
specific embodiment of how discount pricing could be
effected by retrofitting state of the art vending
machies. Accordingly, the Levasseur Patent is merely
35 evidence of a need in the art for the development of
a satisfactory system for providing discount pricing
to vending machines.

It is therefore an object of the present invention to provide a single price vending machine which provides a discount price for multiple purchases of products made during a single sales transaction.

5   According to the invention there is provided a vending machine including in use a plurality of products all of which may be purchased for the same predetermined product price when purchased individually in a single sales transaction, comprising:

10   price-setting means for establishing said same predetermined product price for the vend of a first product and a predetermined price for at least one additional product when a plurality of products are collectively purchased during a single sales transaction, the price of said at least one

15   additional product being less than said same predetermined product price;

accumulator means for receiving money during a single sales transaction and establishing credit toward the purchase of said products;

20   escrow memory means for storing escrow credit established by said accumulator toward the purchase of a first product and at least one additional product during a single sales transaction;

credit detector means for determining when said escrow

25   credit is at least equal to said same predetermined product price and when said escrow credit equals the total of said same predetermined product price and said price of at least one additional product;

product selector means for requesting the vend of a

30   first one or more of said products following the insertion of all money related to said single sales transaction; and

vend discharge control means responsive to said credit detector means for enabling the vend of a first product if said credit detector means d termines that the escrow credit

35   established in said escrow means at least equals said same predetermined product price and additional products if said

escrow detector means determines that said escrow credit is at least equal to the total of said same predetermined product price and said predetermined price of at least one additional product during said single sales transaction.

5   The control circuitry of the present invention may be in the form of a discount module which may be retrofitted into existing state-of-the-art vending machines at a minimal conversion cost.

    The present invention may permit a customer to make a
10 random choice of a plurality of different products during a multiple purchase transaction.

    Preferably price-setting switches are provided which may be operated by a serviceman for pre-setting the price of the first product to be purchased and the price of each
15 subsequent product purchased during a multiple purchase sales transaction, the switches being individually set for each respective product. Preferably, the vending machine may be selectively pre-set by a serviceman to provide a one-for, two-for, or three-for sales capa-
20 bility as a function of pre-set price settings of individual switch groups associated with the first, second and third product to be vended.

    Preferably the accumulation of a maximum amount of escrow credit in excess of a one-for, two-
25 for or three-for price setting precludes the coin acceptor of the vending machine from accepting any more coins. Advantageously, the selection of one or more products stops any further credit escrow and acceptance of coins.

    In a preferred embodiment the vending machine only permits
30 the refund of coins or money up to the accumulation of the first to be vended product price, or if a total machine sold-out condition occurs during the sales transaction, partial sold-out conditions requiring the choice of other products. Thus, a product selection must normally be made once any
35 predetermined level of sales credit associated with one or more products is accumulated, no refund being available under these conditions.

Preferably there is provided a customer interface display means for instructing a customer with respect to price information, sales transaction status and change status during a product vend cycle.

5   Advantageously the vending machine has the capability of storing and reading out sales information with respect to the number of vends made at selected prices and the accuracy of data displayed as a function of satisfactory machine operability during the data acquisition period.

10   Preferably a reserve power system is provided so that the escrow credit memory will not be erased for up to twenty-four hours, if a power failure occurs in the main source of power.

Preferably the vending machine may be interfaced with

15   additional accessories such as a paper currency validator to enable the machine to respond to notes in addition to coins.

In a particularly advantageous embodiment the multiple purchase discount control circuitry of the present invention is in the form of a module which may be fitted as a replace-

20   ment for electronic modules presently utilized in combination with commercially available coin mechanisms. For example, a preferred multiple purchase discount module of the present invention may be substituted for the electronic control module employed in Coin Co 9800 series coin mechanisms manu-

25   factured by Coin Acceptors, Inc. However, it should be understood that a multiple purchase discount module in accordance with the present invention may be utilized with other state of the art coin mechanisms without departure from the scope of the present invention.

30   A preferred embodiment of the invention will now be described, by way of example only, with reference to the accompanying drawings, wherein:

Figure 1 is a circuit schematic of the control circuitry of a typical vending machine into which

35   a   multiple purchase discount module in accordance with the present invention may be retrofitted;

Figure 2 is a circuit schematic of a typical coin

mechanism for interfacing with the control circuit
of Figure 1;

Figure 3 is a multiple purchase discount module
in accordance with the present invention which is interfaced
5   with the coin mechanism of Figure 2 at the terminal pins
bearing like reference numerals;

Figure 4 illustrates one possible embodiment of
how a customer display interface would appear on the
face of a vending machine of the present invention;
10   and

Figure 5 shows one possible arrangement of the
some of the components of the coin mechanism of the
vending machine within the interior of its housing.

The circuitry of the system of the present
15   invention is illustrated by the combination of
Figures 1 to 3. The respective circuits of these
Figures are interfaced together by means of suitable
terminal blocks and/or connectors. For example, the
vending machine control circuitry of Figure 1 and
20   the coin mechanism of Figure 2 are interfaced through
a terminal block TB bearing commercial pin designa-
tion numbers 1 to 8, as illustrated. These
commercial pin numbers correspond to those numbers
of the 9800 Series of (Coin Co) coin mechanisms
25   manufactured by Coin Acceptors, Inc. As stated

hereinbefore, the use of a Coin Acceptors, Inc. 9800
Series coin mechanism is for the purpose of illus-
tration only, it being understood that other forms
of vending control circuits and coin mechanisms may
30   be utilized within the scope of the
present invention. The coin mechanism circuitry of
Figure 2 and the multiple purchase discount module
circuitry of the present invention illustrated in
Figure 3 are interfaced along terminal pins 1 to 20
35   in the manner indicated. These terminal pins 1 to

20 are also the commercial pin designation numbers
of the 9800 Series of Coin Acceptors, Inc. coin
mechanisms.

    Figure 1 illustrates control circuitry for a
5 typical vending machine for use with the present
invention. Alternating current power is supplied to
this circuit through lines L1, L2 and power is
supplied via said lines to vending motor circuitry,
sold-out switches, a vend credit relay VCR, a
10 plurality of product selector switches, and a
correct change indicator lamp. The motor control
circuitry includes in the example illustrated, five
vend motors VN, and five associated motor hold
switches MH-1, MH-2, MH-3, MH-4, MH-5. There are
15 also five sold-out switches with double contacts
1A,1B 2A,2B 3A,3B 4A,4B 5A,5B associated with each
of the respective vend motors in the circuit of
Figure 1 and five product selector switches SS1,
SS2, SS3, SS4, SS5. The vend credit relay coil VCR
20 has three sets of contacts A, B and C, as indicated.
The operation of which will be described more fully
hereinafter.

    Referring in detail to Figure 2, there is
illustrated a typical coin mechanism such as a 9800

Series of Coin Acceptor, Inc., including input
terminal pins 1 to 8 and terminal pins 1 to 20.
The coin mechanism is provided with an empty switch
ES for indicating when the mechanism is out of nickels,
5 requiring the introduction of exact change, a
plurality of coin- reject electromagnets (CREM) 100
for precluding acceptance of coinage into the
vending machine when the CREMs are energized, a
power supply transformer 102, a plurality of coin
10 switches 104 for accepting and counting coins of 5,
10 and 25 cent denominations, an inventory switch
106, a coin pay-out motor 108, and a motor pulse
carry switch 110. An escrow or coin rejector switch
112 is added for use with the multiple purchase
15 module of the present invention. The operation of
the above-described components in conjunction with
the system of the present invention will be more
fully described hereinafter.

Referring in detail to Figure 3, there is
20 illustrated the multiple purchase discount module of
the present invention which includes an electronic
logic board including a microprocessor MP such as an
MB8850, manufactured by Fairchild, Inc., a customer
interface display (see Figure 4) and the display
25 interface 114, an optional back-up battery 116 and a
plurality of DIP switch banks S1, S2, S3 for setting
the prices for first, second and third products
purchased during a single sales transaction and in a
manner to be described more fully hereinafter. The
30 micro- processor MP is provided with a plurality of
inputs designated with a prefix I and associated
identifying suffix. These respective inputs and
their functions in the circuitry will be described

in detail hereinafter. The microprocessor MP also
has a plurality of outputs designated by the prefix
O and appropriate suffix. The circuitry components
interfaced with the microprocessor chip MP will be
5 described hereinafter in connection with the
operation of the system of the present invention in
accordance with the logic functions programmed into
the microprocessor.

In addition, the multiple purchase module of the
10 present invention will accept inputs from an
optional dollar bill validator of any type commer-
cially available.

The microcomputer of Figure 3 makes logical
comparisons between inputs received on the terminals
15 marked I and an internal program in the micro-
processor, and then controls the coin mechansim of
Figure 2 and the vender circuitry of Figure 1 by way
of the microprocessor outputs labeled O. The logic
of the internal program within the microprocessor
20 will be described in detail hereinafter under the
heading "System Logic Functions".

DESCRIPTION OF OPERATION

Coin Acceptance 5¢, 10¢, 25¢

The Coin Rejector Electro-magnets (CRENs) are
25 controlled by the microprocessor MP logic rather
than by the vendor control circuitry of Figure 1 as
would be conventional in a single purchase vending
machine.

In a conventional coin mechanism control vendor
30 the CRENs which are located in the coin mechanism of
Figure 2 and labeled 100 are wired via a pin 6 of

the coin mechanism terminal block TB to the sold-out
switches 1A, 2A, 3A, 4A, 5A, the motor switches MH-
1, MH-2, MH-3, MH-4, MH-5 and a normally closed
contact B of the vend credit relay VCR.

5   With the traditional wiring of the CREMs, the
coin mechanism of Figure 2 would not accept coinage,
i.e., the CREMs become de-energized when:

1) a vend credit was established (i.e., VCR coil
of Figure 1 is energized); or

10   2) the vendor was sold out in all columns (i.e.,
all sold-out switches 1A to 5A are open).
Following the establishment of a vend credit, the
traditional coin mechanism of a single-purchase
vending machine refuses, via the CREMs, to accept

15   further coinage until the sales transaction has been
completed. With this traditional hard-wired logic,
a sales transaction is not completed until a vend
has occured (signaled by the opening of one of the
respective motor hold switches MH-1 to 5).

20   In contrast to the traditional single-sales
transaction vending machines described above, in the
present invention the CREMs 100 are controlled by
the logic in the microprocessor MP. The micro-
processor MP controls the CREMs via output O-Φ.

25   O-Φ forces an inverting buffer IN-2 which energizes
the coil of a relay R2. The normally open contact of
relay R2 illustrated in Figure 3 as being coupled
directly to interface terminal 19, closes, completing
the circuit to energize the CREMs 100.

30   The CREMs remain energized until:

1) Coinage accepted exceeds the sum of the prices
of the maximum number of allowable purchases as

determined by the maximum purchase logic to be
described hereinafter; or

     2) a selection has been made by one of the
product selector switches SS-1 to SS-5.

    Once the selection is made, the sales transaction
is completed. The completion of a selection is
determined by the vend motor which includes a cam
which opens one of the motor hold switches MH-1 to MH-
5 corresponding to one of the associated selector
switches which has been actuated. Opening of the
motor hold switch unlatches the vend credit relay VCR
hold circuit. This condition is then sensed via the
microprocessor MP input I-Φ. I-Φ is connected,
through an opto-isolator OC2 to the coin mechanism
connector pin 6. Coin mechanism connector pin 6 is
energized when the vend credit relay VCR is de-
energized; or

    3) the vending machine is sold out in all
columns (all the sold-out switches are open) and this
sold-out condition is also sensed via input I-Φ as
described above.

    When any of these conditions are sensed at I-b,
0-Φ goes low, permitting the CREMs to de-energize.

Vend Credit Capability

    The system of the present invention is designed so
that up to three vend credits can be accumulated in
the memory of the microprocessor, depending on the
price settings of switch bank S-1, S-2, S-3, to be
described hereinafter. Once sufficient coinage has
been accepted to allow the purchase of a first
product, the microprocessor MP output O-5 forces a
relay coil R1 via inverting buffer IN-1 to a
momentarily energized state. The energization of coil

R1 causes the associated relay contact R1'A' to close
and R1'B' to open. Closing contacts R1'A' completes
the circuit to the vend credit relay coil VCR via coin
mechanism connector pin 3. The contacts of vend
5   credit relay coil VCR then change their respective
states. That is, the normally open contacts close
and the normally closed contacts open. Closing of VCR
contacts A completes the vendor circuit through the
motor hold switches MH-1 to MH-5 and the sold-out
10   switches 1A to 5A to the vend credit relay coil VCR.
The vend credit relay coil VCR will remain energized
by this circuit until the motor hold switches MH-1 to
MH-5 break the circuit during a vending operation.

Up to this point, the operation description is
15   similar to that of a traditional vendor. However, as
stated hereinbefore, with a traditional vendor the
CREMs would de-energize, preventing acceptance of
additional coinage before money could be accumulated
or escrowed toward the purchase of additional products.
20   However, as explained hereinbefore, the multiple
purchase discount logic board of the present invention
illustrated in Figure 3, prevents the CREMs from de-
energizing at this point in the cycle, and hence
allows acceptance of additional coinage towards
25   additional purchases during the same sales
transaction.

If enough coinage is accepted to allow a second or additional purchase, a vend credit is held in the microprocessor memory.

If enough additional coinage is accepted to allow a third vend or purchase, an additional vend credit is held in the memory toward this third purchase.

Once the first vend occurs, as sensed via input I-ϕ of the microprocessor MP, the vend credit relay coil VCR is energized thereby until the second or third vend occurs and all purchases requested up to three during a single sales transaction have been completed.

Dollar Acceptance Capability

The multiple purchase discount module of the present invention has the capability of accepting an input from a dollar bill (or coin) validation device DBV, as illustrated in Figure 3. Microprocessor Input I-6 is normally held at +5v. by a 10kΩ pull-up resistor. If the resistor is pulled low by a contact closure, the sensing of this change of state increments the internal memory of money accepted by the amount of $1.00.

Customer Interface Display

The inclusion of an optional customer interface display 120, as illustrated in Figure 4, provides for communication between the customer and the machine throughout the sales transaction, informing the customer of the transaction status at each associated step. Figure 4 illustrates the customer display interface as it would be seen on the face of a vending machine, the central portion representing a liquid crystal display in which a message "correct change only" dollar amounts deposited and the instructions to

make a selection appear. If desired, the information
around this central portion of the display in Figure 4
which includes general directions and the type of
multiple discount offered, may be applied to the face
5   of the machine surrounding the display by means of a
suitable decal. In this manner, this information and
offer may be readily changed depending on the price
settings set by a service man on the price-setting
switches S1 to S3. The nature and operation of the
10   display will be more fully explained hereinafter with
reference to the system logic functions.

The display of Figure 4 may also be utilized to
display data associated with the operation of the vend
count switch 118 of Figure 3, which causes the
15   microprocessor MP, when an input is sensed at terminal
I-7, to interrupt the operation of the micro- computer
and cause the same to display sales data with respect
to the number of vends at each respective price which
have occured over a period of interest. The vend
20   count switch 118 is mounted within the housing of the
coin acceptor mechanism and is not accessible to
consumers.

The optional back-up battery 116 ensures the
accuracy of the display vend count in that it provides
25   power to the microprocessor MP memory during power
outages.

The "correct change only" instruction illustrated
in the display of Figure 4 occurs if input I-8 of
microprocessor MP senses closure of the 5¢ tube empty
30   switch ES of the coin mechanism of Figure 2. I-8 is
interfaced to the 5¢ tube empty switch ES by means of
an opto-isolator OC1. Closure of the 5¢ tube empty
switch ES will cause the microprocessor MP to instruct

the liquid crystal display portion illustrated in
Figure 4 to generate the "correct change only"
message.

Coin Return

The escrow or coin rejector switch 112 illustrated
in Figure 2 is a small mechanical switch mounted
behind the coin acceptor plate of the coin mechanism
body. Acutation of the externally-mounted coin reject
lever causes movement in the coin acceptor plate. This
movement causes a contact closure in the coin rejector
switch 112. Once these contacts are closed, deposited
money can be returned to the consumer via output O-4
of microprocessor MP and the associated coin pay-out
motor 108. The conditions under which a coin return
or refund may occur are described more fully
hereinafter in the detailed description of the system
logic functions.

The output O-4 in the associated circuitry within
microprocessor MP are also used as the control
circuitry for the change-return function to be
discussed hereinafter.

Price-Setting Operation

The price-setting switches S1 to S3 illustrated in
Figure 3 comprise three sets of Dual-In-Line (DIP)
switches S1, S2, S3, coupled to the microprocessor MP
at input terminals I-1, I-2, I-3, I-4, I-5. Each of
the DIP switch groups S1 to S3 contains five discrete
switches, the closing of which is correlated to price
information such as 5, 10, 20, 40 or 80¢.

The prices for the first, second and third purchases, during a single-sales transaction, are manually set by the serviceman via the switches S1, S2, S3, respectively. Once set, these switches remain closed until manually switched open. Accordingly, a serviceman may set the multiple-purchase discount module for operation in accordance with the "special offer" multiple purchase price information displayed on the decal surrounding the consumer interface display illustrated in Figure 4.

By way of example, the price of a first product to be purchased during a sales transaction may be set at 50¢; the second purchase price at 45¢ and the third purchase price at 25¢. In this example, a customer could then purchase one product for 50¢, two for 95¢ or three for $1.20. In this example, the first set of DIP switches S-1 would have the 40¢ switch and the 10¢ switch closed for a total price of 50¢. The second set of DIP switches S-2 would have the 40¢ switch and the 5¢ switch closed, indicating a total price of 45¢. The third set of DIP switches would have the 40¢ switch closed and the 5¢ switch closed for a purchase price of 25¢. By using all possible combinations of switches, it is possible to set prices for each purchase according to the following Table:

TABLE A

	Switches					Purchase Price
	5¢	10¢	20¢	40¢	80¢	
	X					5¢
5		X				10¢
	X	X				15¢
			X			20¢
	X		X			25¢
		X	X			30¢
10	X	X	X			35¢
				X		40¢
	X			X		45¢
		X		X		50¢
	X	X		X		55¢
15			X	X		60¢
	X		X	X		65¢
		X	X	X		70¢
	X	X	X	X		75¢
					X	80¢
20	X				X	85¢
		X			X	90¢
	X	X			X	95¢
			X		X	100¢

Switches					Purchase Price
5¢	10¢	20¢	40¢	80¢	
X		X		X	105¢
	X	X		X	110¢
X	X	X		X	115¢
			X	X	120¢
X			X	X	125¢
	X		X	X	130¢
X	X		X	X	135¢
		X	X	X	140¢
X		X	X	X	145¢
	X	X	X	X	150¢
X	X	X	X	X	155¢

NOTE: X INDICATES CLOSED SWITCH

The microprocessor MP scans or reads the price setting switches S1 to S3 by a standard strobing or multiplex type of operation. This operation is essentially as follows: Input lines I-1 through I-5 are normally held at +5v. by the price-setting pull-up resistors PR. Output lines O-1 through O-3 are switched to ground one at a time as they are strobed by the microprocessor MP under control of the program therein. When output O-1 is switched to ground (0 volts), the first price-setting switches S1 are

given a path to ground, and the inputs I-1 to I-5
sense this path to ground only if the price- setting
switch connected to the particular input is closed.
Output O-2 is used for the second price- setting
switch S2 and O-3 is operatively associated with the
third price-setting switches S3.

The diode attached to the normally open side of
each price-setting switch prevents the +5v. from
back-feeding through closed switches, which would
result in faulty readings. As will become more fully
apparent hereinafter, when described in connection
with the specific system logic functions, the
relative values of the price-setting switches SI to
S3 determine whether a one-for, two-for, or three-for
purchase is available to a customer, and prices for
each of the respective categories.

Pay-Out Motor Circuitry

When pay-out is to be given, either due to
change or refund, output O-4 of microprocessor MP
forces the two parallel inverting buffers IN-3 ON.
Turning the buffers ON connects the pay-out motor 108
of Figure 2 to ground. This completed circuit
through the pay-out motor 108 causes the motor
pulse/carry switch 110 to open as each nickel is
ejected from the pay-out tubes. As will be described
hereinafter, a visual display on display 120 occurs
each time a nickel is ejected. Closure of the motor
pulse/motor carry switch 110 provides I-10 with a
path to ground. When this switch is open, I-10 is
pulled to +5v. by the associated pull-up resistor.

The microprocessor MP memory which stores the amount
of change or escrow due, is decremented by 5¢ with
each opening of the switch 110.

The switch 110 also ensures that the pay-out
motor 108 completes the transaction cycle by
providing the pay-out motor with a path to ground
until the motor cam opens the path to ground.　An
inventory switch 106 is provided for service persons
so the pay-out motor 108 may be manually energized
for testing purposes.

Coin-Acceptor Switches 104

Coins are accepted or rejected by the coin
acceptor plate of the coin mechanism and are
separated into denominations of 5, 10 and 25¢, as
illustrated by the coin switches 104.　As the
accepted coins fall through the 5, 10 or 25¢ channels
of the switches 104, the coin trips a switch wire
which momentarily opens the 5, 10 or 25¢ switch
contact.

Inputs I-11, I-12, and I-13 are normally
switched to ground by the 5, 10 and 25¢ switches.
Opening of the switch contacts causes the input to be
pulled to +5v. by the pull-up resistor.　As these
inputs are switched, the MP microprocessor increments
the escrow memory by the appropriate amount
deposited.　It is in this manner that escrow credit
is established towards purchases to be made.

Power Supply

The coin mechanism circuitry of Figure 2 contains a transformer that provides the logic board of Figure 3 with 24 VAC. This 24 VAC is converted by the circuitry of the power supply P.S.A' to 20 VDC. The 20 VDC is converted by P.S.B' to 5 VDC. As stated hereinbefore, an optional 5 v. battery 116 can be provided to provide back-up power. The optional battery 116, Escrow switch 112, Accountability switch 118, and price-setting switches S1-S3 are all mounted within the coin mechanism as illustrated in Figure 5, making them inaccessible to customers.

SYSTEM LOGIC FUNCTIONS

As stated hereinbefore, the microprocessor MP of Figure 3 has an internal program which operates on the inputs on terminals I, and then generates outputs that control the coin mechanism of Figure 2 and the vendor control circuitry of Figure 1. Since it is well within the ordinary skill of a computer programmer to write sufficient software to implement the preferred logic functions of the present invention, specific programs will not be discussed hereinafter. However, a narrative description of the logic functions and their intended operation will be described to facilitate a programmer to readily compose a program appropriately correlated with any type of microprocessor utilized.

In a preferred embodiment of the present
invention, a maximum of three packages can be
dispensed in a single sales transaction. As des-
cribed hereinbefore, the price per package is set by
means of the three sets of binary DIP switches S1 to
S3. The maximum price setting per set of switches in
a preferred embodiment of the present invention is
$1.55. By setting the individual price per package
with switches S1 to S3, the microprocessor MP adds
the individual price settings and allows escrow up to
20¢ above the total accumulated vend price. After
this total is reached, the coin mechanism of Figure 2
will no longer accept coins because microprocessor MP
generates a signal at terminal I-Φ to de-energize
the CREMs. The customer can then randomly push the
selection buttons SS1-1 to SS-5 as many times as
credit has been established in the memory of MP and
receive vended products from those selections. Once
the escrowed credit in the memory of MP is
decremented with purchases to an amount below that
required for a purchase, the remaining credit is
returned via the pay-out tubes as change. The
microprocessor MP can be set to allow for a one-for,
two-for, or three-for purchase. A one-for price
setting on switches S1 will allow escrow of credit up
to 20¢ above the first price setting. The two-for
price setting allows escrow of credit up to 20¢ above
the total of the first and second price setting. The
three-for price setting allows escrow of credit up to
20¢ above the total of the first, second, and third
price settings.

Using the binary DIP switch sets S1 to S3, the following price settings will allow the respective one-for, two-for and three-for functions described above:

5

TABLE B

Case 1	If the second price setting is greater than the first, the unit maintains a one-for capability. No multiple purchase capability from this setting.
Case 2	If the second price setting is equal to the first and the third is greater than or equal to the second, the unit maintains a one-for capability.
Case 3	If the second price setting is less than the first, and the third is greater than or equal to the second, the unit maintains a one-for capability.
Case 4	If the second price setting is less than the first and the third is equal to or less than the second, the unit maintains a two-for or three-for option.
Case 5	If the second price setting is equal to the first and the third is less than the second, the unit maintains a two-for or three-for option.
Case 6	If all the price settings are zero, the vendor will require no money to vend. This is referred to as free vend.

If a customer wishes to utilize the multiple purchase feature offered by the vending machine of the present invention in accordance with the price settings of the switches S1 to S3, he must first escrow sufficient credit for at least the first product to be purchased. Once a selection is made of the products by selector switches SS-1 to SS-5, the

transaction is considered complete because the CREMs become de-energized and will not allow the acceptance of any further money until all the credit is cleared by the appropriate selections being made or change returned. If more than one product is to be purchased, the customer may elect to utilize one or two options of the possible transaction. As in the two-for or three-for setting, it is possible to make only a single selection, or in the case of the three-for setting, only two selections can be made. In all cases, however, the transaction is completed once credit is established and a selection is made. The multiple purchase option cannot be utilized and repeated for successive single vend transactions, but rather is only available during a single sales transaction.

The system of the present invention also has the capability to return escrowed credit up to the first vend price. If credit has not been established, the coin return lever can be pressed and the credit will be returned. However, once credit is established, change is returned only when the credit exceeds the total price accumulated for the type of transaction desired. For example, if the setting was one for 40¢, two for 75¢ and three for $1.00, and a customer deposited 85¢, 10¢ change would automatically be returned after the second selection was made. In all cases of the one-for, two-for or three-for option, once any level of credit is established, a selection must be made according to that level of credit established.

In a case where total machine sold-out occurs, accompanied by the opening of switch contacts 1A,B to 5A,B of Figure 1 while a sales transaction is in progress, the escrowed credit will be automatically returned via the change return mechanism, namely, pay-out motor 108. However, if only one or several columns becomes sold out during a transaction, an alternate selection must be made, as no credit will be returned.

As described hereinbefore, the multiple purchase discount module of the present invention may be interfaced with a liquid crystal display and account-ability switch 118 to display the number of vends made at the different respective price settings of the switches. This accountability feature is activated in accordance with the logic in micro-processor MP to flash the number of vends at the first price setting on the liquid crystal display of display means 120, pause, and then flash the number of the second setting, pause, and finally flash the number of the third setting. The system of the present invention is capable of displaying from zero to one thousand, nine hundred ninety-nine vends and then reset to zero. For a four-digit number, the dollar symbol of the display is utilized to designate the one thousand quantity.

The following transaction examples are provided to provide a more complete understanding of the present invention. The left-hand column represents steps formed by a customer during a sales transaction; the center column information displayed on the LCD screen of Figure 4 during the sales transaction; and the third column, the logic sequence performed by the combined circuitry of Figures 1 to 3.

TRANSACTION EXAMPLE 1:

CUSTOMER ACTION	LCD	LOGIC SEQUENCE
	$.40	CREM ENERGIZED
DEPOSIT COINS		
25¢	$.25 AMOUNT DEPOSITED	
10¢	$.35 AMOUNT DEPOSITED	
5¢	$.40 AMOUNT DEPOSITED	1ST CREDIT ESCROW
25¢	$.65 AMOUNT DEPOSITED	
25¢	$.90 AMOUNT DEPOSITED	2ND CREDIT ESCROW
25¢	$1.15 MAKE SELECTION	3RD CREDIT ESCROW CREM DE-ENERGIZED
PUSH ANY SELECTION BUTTON	MAKE SELECTION	VEND PRODUCT, INCREMENT ACCUMULATOR #1
PUSH ANY SELECTION BUTTON	MAKE SELECTION	VEND PRODUCT, INCREMENT ACCUMULATOR #2
PUSH ANY SELECTION BUTTON		VEND PRODUCT, INCREMENT ACCUMULATOR #3
	CHANGE $.15	RETURN ESCROW CREDIT IN 5¢ INCREMENTS
	CHANGE $.10	
	CHANGE $.05	
	CHANGE $.00	
	CHANGE $.40	CREM ENERGIZED

TRANSACTION EXAMPLE 2:

CUSTOMER ACTION	LCD	LOGIC SEQUENCE
	$.40	CREM ENERGIZED
DEPOSIT COINS		
25¢	$.25 AMOUNT DEPOSITED	
10¢	$.35 AMOUNT DEPOSITED	
PRESS COIN RETURN	CHANGE $.35 CHANGE $.30 · · · · · CHANGE $.00	RETURN COIN CREDIT IN 5¢ INCREMENTS CREM DE-ENERGIZED
	$.40	CREM ENERGIZED

TRANSACTION EXAMPLE 3:

CUSTOMER ACTION	LCD	LOGIC SEQUENCE
	$.40	CREM-ENERGIZED
DEPOSIT COINS		
25¢	$.25 AMOUNT DEPOSITED	
25¢	$.50 AMOUNT DEPOSITED	1ST CREDIT ESCROW
PRESS COIN RETURN	$.50 AMOUNT DEPOSITED	NO ACTION
10¢	$.60 AMOUNT DEPOSITED	
25¢	$.85 AMOUNT DEPOSITED	2ND CREDIT ESCROW
PUSH ANY SELECTION BUTTON	MAKE SELECTION	VEND PRODUCT, INCREMENT ACCUMULATOR 1 CREM DE-ENERGIZED
PRESS COIN RETURN	MAKE SELECTION	NO ACTION
PRESS SOLD OUT SELECTION	MAKE SELECTION	NO ACTION
PUSH ANY SELECTION BUTTON	CHANGE $.10	VEND PRODUCT, INCREMENT ACCUMULATOR 2
	CHANGE $.05	
	CHANGE $.00	
	$.40	CREM ENERGIZED

TRANSACTION EXAMPLE 4:

CUSTOMER ACTION		LCD	LOGIC SEQUENCE
		$.40	CREM ENERGIZED
DEPOSIT COINS			
	25¢	$.25 AMOUNT DEPOSITED	
	25¢	$.50 AMOUNT DEPOSITED	1ST CREDIT ESCROW
	25¢	$.75 AMOUNT DEPOSITED	2ND CREDIT ESCROW
PUSH ANY SELECTION BUTTON			VEND PRODUCT, INCREMENT ACCUMULATOR #1 DE-ENERGIZE CREM

* TOTAL MACHINE SOLD OUT OCCURS *

CHANGE
$.35

CHANGE
$.30

CHANGE
$.25

CHANGE
$.20

•
•
•

CHANGE
$.00

WILL NOT ACCEPT   ----   CREM DE-ENERGIZED
COINS

The system of the present invention, having being thus described, it should be understood that it may be modified as would occur to one of ordinary skill in the art without departing from the scope of the present invention.

5

CLAIMS:

1. A vending machine including in use a plurality of
products all of which may be purchased for the same pre-
determined product price when purchased individually in a
5   single sales transaction, comprising:
        price-setting means for establishing said
same predetermined product price for the vend of
a first product and a predetermined price for at
least one additional product when a plurality
10 of products are collectively purchased during
    a single sales transaction, the price of said
    at least one additional product being less than
    said same predetermined product price;
        accumulator means for receiving money during
15 a   single sales transaction and establishing
    credit toward the purchase of said products;
        escrow memory means for storing escrow credit
    established by said accumulator toward the purchase
    of a first product and at least one additional
20 product during a single sales transaction;
        credit detector means for determining when
    said escrow credit is at least equal to said same
    predetermined product price and when said escrow
    credit equals the total of said same predetermined
25 product price and said price of at least one
    additional product;
        product selector means for requesting the
    vend of a first one or more of said products
    following the insertion of all money related to
30 said single sales transaction; and

vend discharge control means responsive to
said credit detector means for enabling the
·vend of a first product if said credit detector
means determines that the escrow credit established
5　in said escrow means at least equals said same
predetermined product price and additional products
if said escrow detector means determines that
said escrow credit is at least equal to the
total of said same predetermined product price
10　and said predetermined price of at least
one additional product during said single sales
transaction.

2. The vending machine of claim 1, further
comprising:
15　change return means for returning a value of
coins received during said sales transaction
which is in excess of the cumulative total of
escrow credit established in said escrow memory
means.

20　3. The vending machine of claim 2, further
comprising:
means for inhibiting the operation of said
change return means after escrow credit is established
at least equal to said same predetermined product
25　price until said product selector means is actuated
a number of times commensurate with the total
product credit established in said escrow memory
means in accordance with price values established
by said price setting means.

4. The vending machine of claim 3 wherein
said means for inhibiting comprises:

    credit reduction means for decrementing the
total credit established in said escrow memory
5   means in response to each request for a vend by
said product selector means; and

    means for enabling said change return means
only when the total credit in said escrow memory
means falls below said same predetermined product
10 price.

5. The vending machine of any preceding claim, further
comprising:

    coin rejector means for precluding the receipt
of coins by said accumulator means and returning
15 the same to a customer in response to escrow
credit established in said escrow memory means equal
to a predetermined excess above the total of
said same predetermined product price and said
price of said at least one additional product.

20   6. The vending machine of any preceding claim, further
comprising:

    coin rejector means for precluding the receipt
of coins by said accumulator means and returning
the same to a customer in response to one or
25 more requests for vends by said product selector
means.

7. The vending machine of any preceding claim, wherein
said price setting means comprises a first group

of manually adjustable digital switches for
generating a digital price code for said first
product to be vended and a like group of manually
adjustable digital switches for each additional
5   product to be vended in a single transaction.

8. The vending machine of claim 7, further
comprising logic means for comparing the digital
price codes set by said groups of switches and
determining the number of vends which can be
10 made by said machine during a single sales
transaction as a function of said digital price
codes set.

9. The vending machine of claim 2, further
comprising means for enabling said coin return
15 means to automatically refund coins received
during said single sales transaction if said
machine becomes completely sold out of products
during said transaction.

10.   The vending machine of any preceding claim, further
20 including display means to advise and instruct a
customer as to the status and sequence of vend
operations occurring during said single sales
transaction.

11. The vending machine of claim 10, further
25 including accountability means for storing sales
transaction data in said escrow memory means

according to the number of vends which have
occurred at each respective vend price set by
said price setting means.

12. The vending machine of any preceding claim, further
including a primary power source and a secondary
power source, said secondary power source providing
power to at least said escrow memory means if
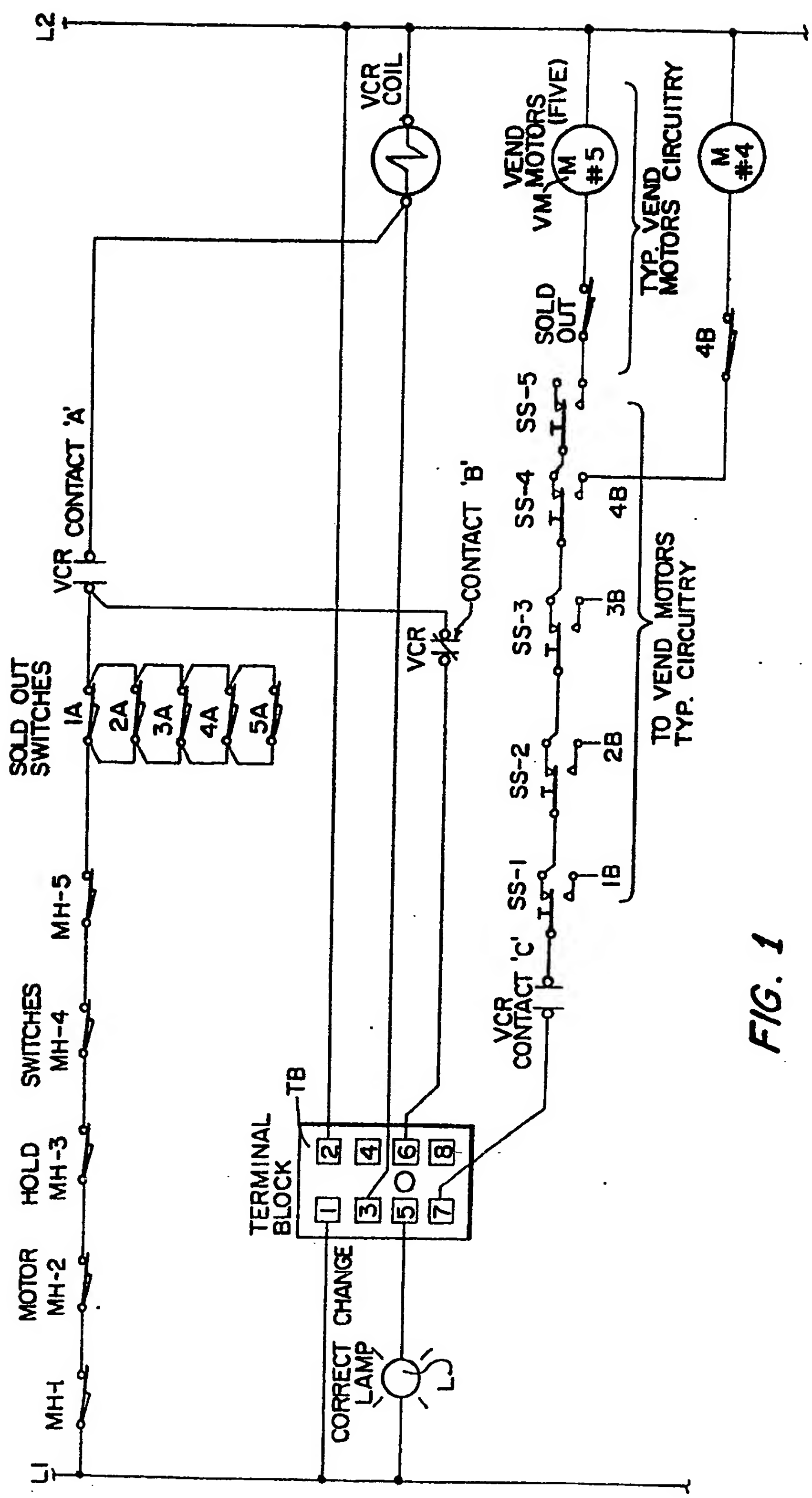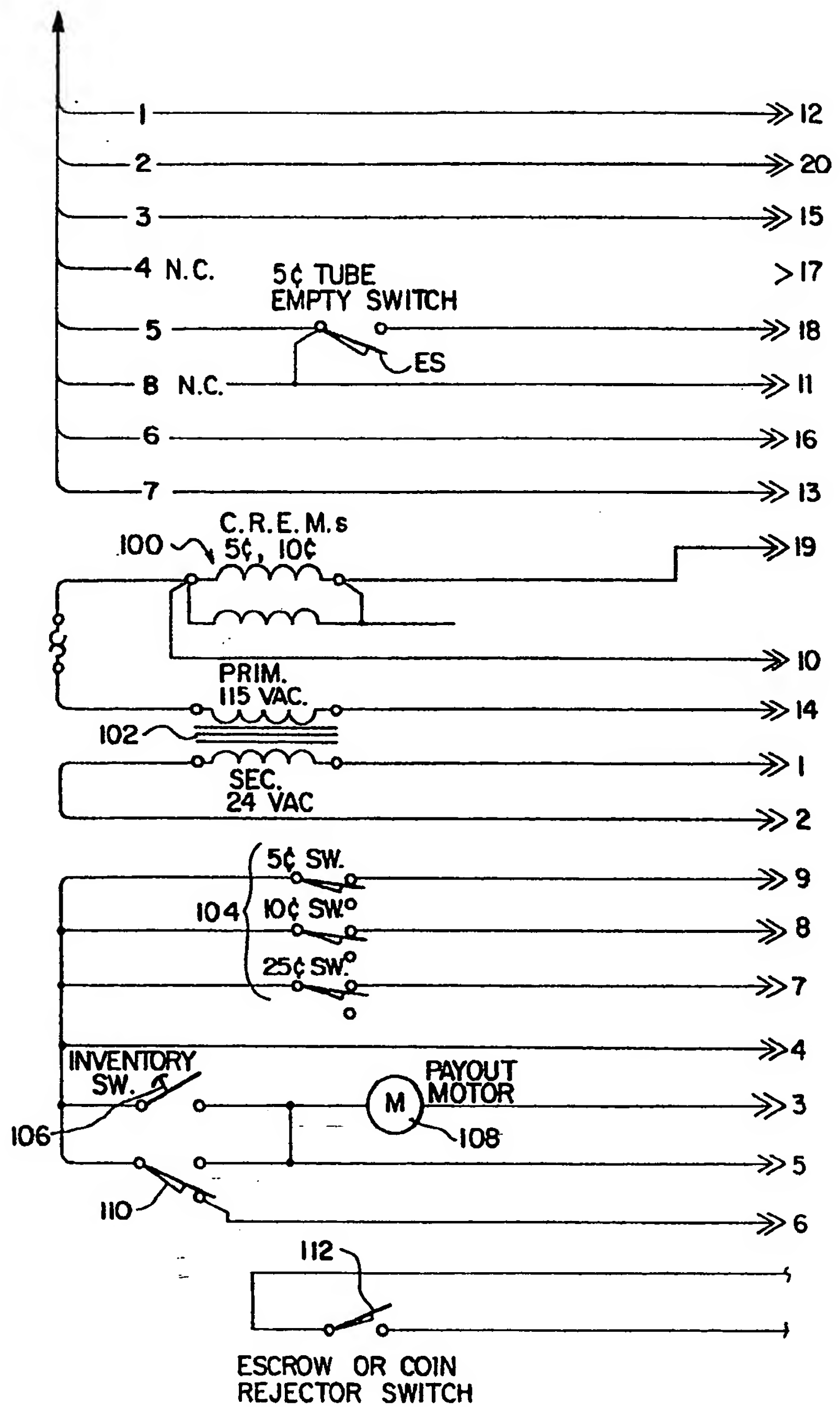power from said primary power source is interrupted.
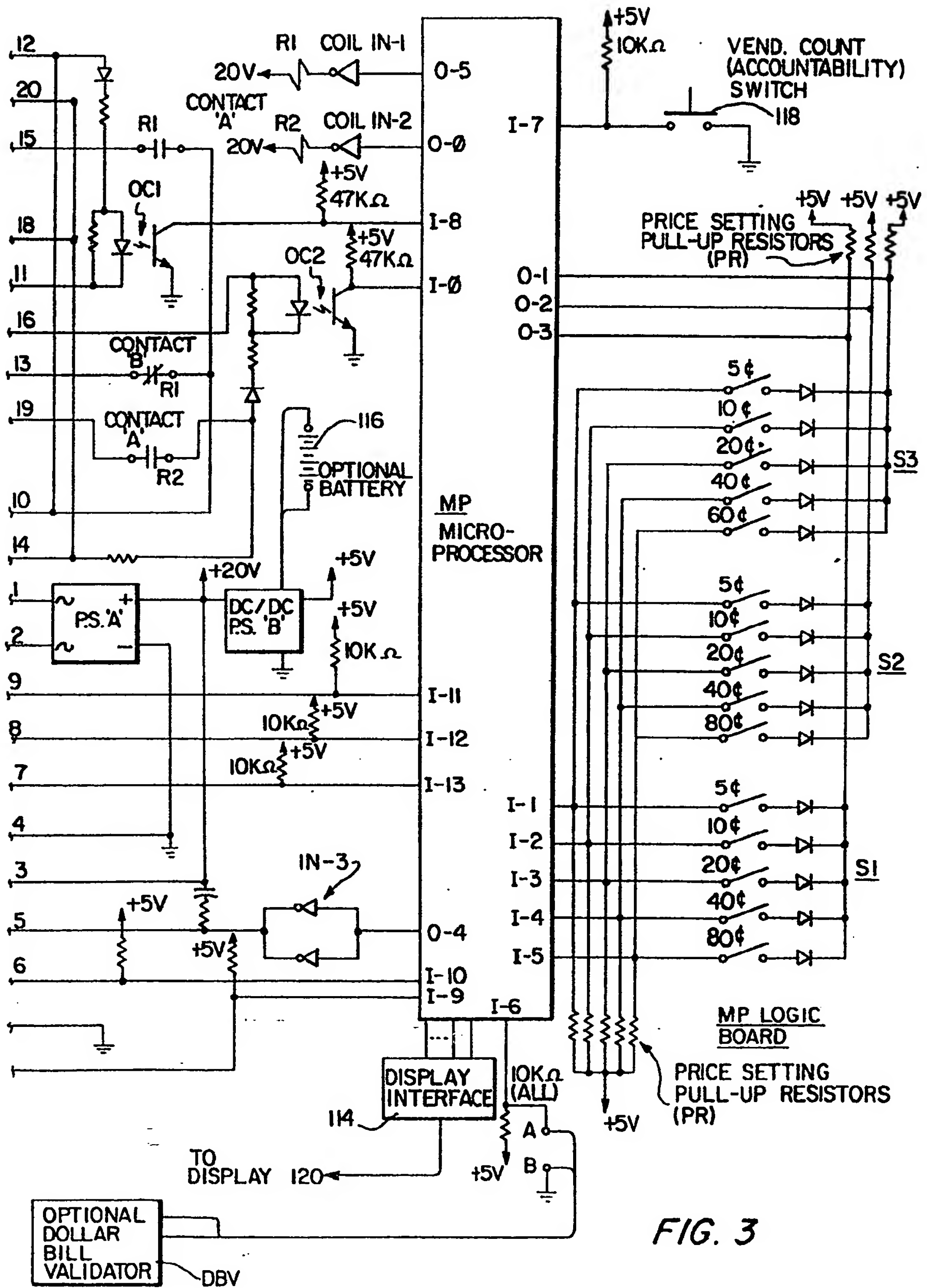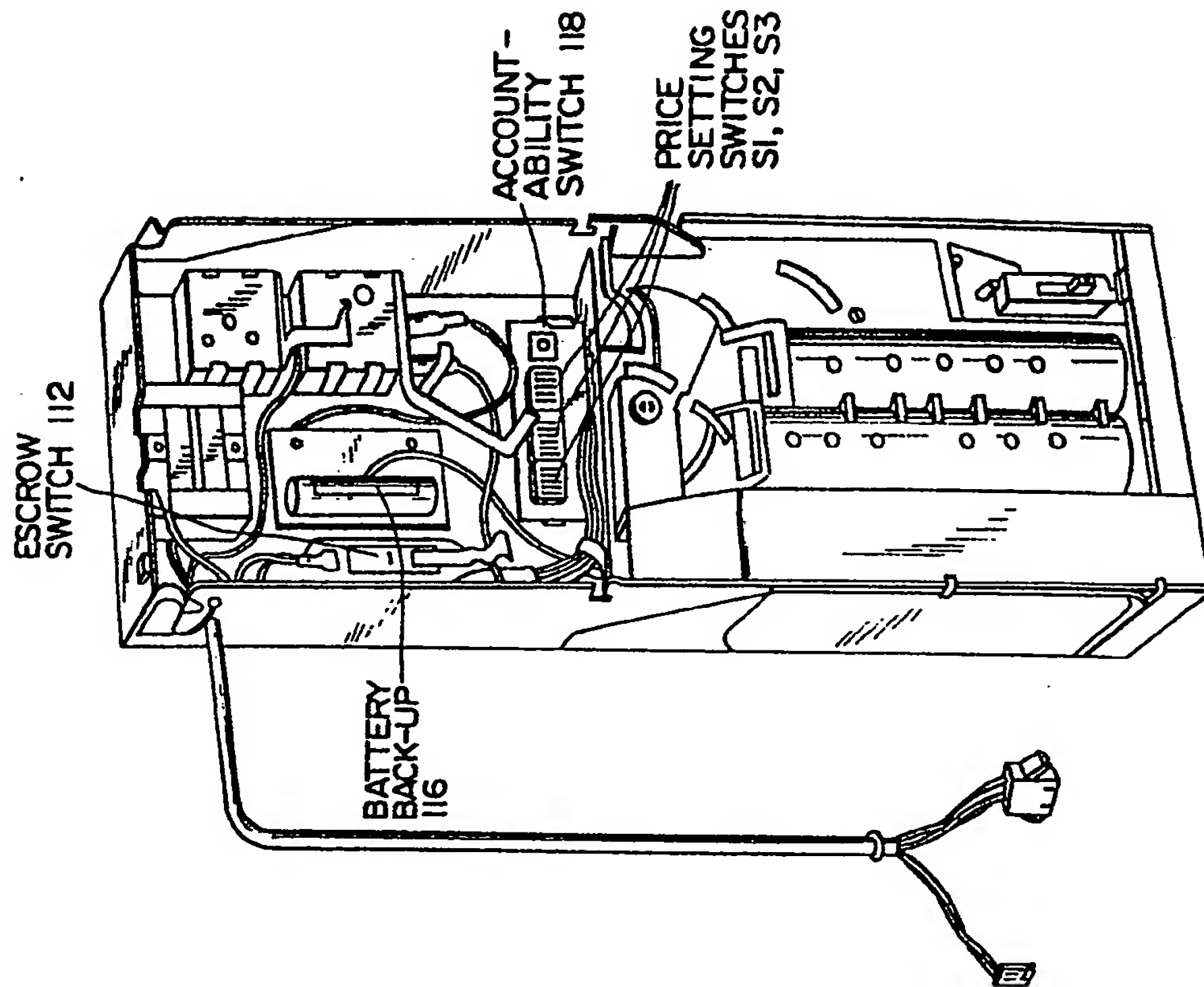
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FIG. 1

FIG. 2

0085546

FIG. 3

0085546

ESCROW
SWITCH 112

ACCOUNT-
ABILITY
SWITCH 118

PRICE
SETTING
SWITCHES
S1, S2, S3

BATTERY
BACK-UP
116

FIG. 5

SPECIAL OFFER

BUY 1 FOR 40¢ OR,
BUY 2 FOR 75¢ OR,
BUY 3 FOR $1.00
SEE INSTRUCTIONS BEFORE

$ CORRECT
CHANGE
ONLY

AMT. DEPOSITED
MAKE SELECTION

LCD

1. INSERT COINS REQUIRED
FOR DESIRED PURCHASE
QUANTITY (ABOVE).

2. MAKE SELECTIONS

FIG. 4

120